Natural Area
CONSULTING MANAGEMENT SERVICES

Shire of Capel

Capel Offset Planting Project (Kemerton)

Monitoring Report April 2022

Natural Area Holdings Pty Ltd
57 Boulder Road, Malaga WA 6090
Ph: (08) 9209 2767
info@naturalarea.com.au
www.naturalarea.com.au

Acknowledgement of Country

Ngala kaaditj Noongar moort keyen kaadak nidja boodja.
Natural Area acknowledges the Traditional Owners of the lands on which we operate, and recognises their continuing connection to lands, waters and communities.

Disclaimer

Natural Area Holdings Pty Ltd, trading as Natural Area Consulting Management Services (Natural Area), has prepared this report for the sole use of the Client and for the purposes as stated in the agreement between the Client and Natural Area under which this work was completed. This report may not be relied upon by any other party without the express written agreement of Natural Area. No part of this document may be copied, duplicated, or disclosed without the express written permission of the Client and Natural Area

Natural Area has exercised due and customary care in the preparation of this document and has not, unless specifically stated, independently verified information provided by others. No other warranty, expressed or implied, is made in relation to the contents of this report. Therefore, Natural Area assumes no liability for any loss resulting from errors, omission or misrepresentations made by others. This document has been made at the request of the Client. The use of this document by unauthorised third parties without written permission from Natural Area shall be at their own risk, and we accept no duty of care to any such third party.

Any recommendations, opinions or findings stated in this report are based on circumstances and facts as they existed at the time Natural Area performed the work. Any changes in such circumstances and facts upon which this document is based may adversely affect any recommendations, opinions or findings contained in this document.

System Certifications

Environmental management system registered to ISO 14001:2015
Quality management system registered to ISO 9001:2015
Occupational health and safety management system registered to AS/NZS 4801:2001

Document Title	SoCa-R Kemerton Monitoring Report April 2022
Location	NACMS Master Drive/Client Folders GPB/Shire of Capel/RFT 21-04 Offset Planting Kemerton/Monitoring/April 2022/SoCa-R Kemerton Moniroting Report April 2022.docx

Draft/Version No.	Date	Changes	Prepared by	Approved by	Status
V1	03/05/2022	New Document	SNH	KC	Released

Contents

1.0 Introduction....4
2.0 Methods....6
3.0 Results....9
4.0 Recommendations....11
Appendix 1 – Quadrat Monitoring Data....12
Appendix 2 – Quadrat Photos/Photo Monitoring....12

1.0 Introduction

Natural Area Consulting Management Services (Natural Area) was contracted in March 2021 by the Shire of Capel to undertake the rehabilitation of a 3.6 ha offset site located within the Kemerton Industrial Estate Buffer, within the Shire of Harvey (Figure 1). The offset site is owned by the Department of Biodiversity, Conservation and Attractions, and is required to be rehabilitated as part of offset requirements associated with clearing permits obtained for road upgrades into adjacent road reserves within the Shire of Capel. The offset is surrounded predominantly by vegetation and agricultural land. Prior to rehabilitation, it was an area of cleared pastureland, containing sparse native tree species and no native understorey.

Monitoring is scheduled to be undertaken twice annually (in spring and autumn) for a minimum period of three years following revegetation. Final maintenance and monitoring are anticipated to be undertaken in February 2026, at which point the offset site will be assessed against the specified completion criteria. A schedule of events showing planting, monitoring, maintenance and reporting works is provided below (Table 1 - 3). Works undertaken from March 2021 to present have included:

- fencing installation
- track realignment
- firebreak installation
- weed control
- feral vertebrate management
- revegetation
- monitoring.

To date, revegetation has involved the installation of a total of 3,630 tubestock from nine overstorey species in August 2021. Further installation of species from all strata levels (overstorey, midstorey and understorey) is scheduled for the 2022 winter period. The purpose of this report is to outline the results of revegetation and site maintenance works undertaken to date, including assessment against completion criteria, and recommendations for future revegetation and maintenance.

Whilst the completion criteria are not required to be met until completion of the three-year maintenance period, evaluation during the course of the project will identify works priorities and allow them to be addressed in a time-efficient manner. The completion criteria are as follows:

- an overall tubestock survival rate of 70%, with the following strata criteria:
  - 75% of trees (overstorey)
  - 55% of shrubs (middle storey)
  - 75% of herbs (understorey)
- a maximum bare ground patch size of 30 m^2
- a decrease > 70% in cover and population density of Perennial Veldt Grass (*Ehrharta calycina*)
- a decrease of 90% in the cover of Red Ink Plant (*Phytolacca octandra*)
- a decrease of 90% in the cover of False Onion Weed (*Trachyandra divaricata*)
- eradication of Blackberry (*Rubus laudatus*) and Arum Lily (*Zantedeschia aethiopica*)
- no obvious presence of rabbits or kangaroos
- a maximum of 5% of plants affected by rabbit and/or kangaroo herbivory
- gates and boundary fence in good condition.

Table 1: Works schedule for Year 1 (2021-2022)

	Year 1											
Activity	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**	**J**	**F**
Monitoring visit 1												
Initial planting (3,630)												
Other/general maintenance												

Table 2: Works schedule for Year 2 and Year 3 (2022-2024)

	Year 2												Year 3											
Activity	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**	**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**	**J**	**F**
Planting (31,370 tubestock)																								
Monitoring																								
General Maintenance																								
Annual Report																								

Table 3: Works schedule for Year 4 and Year 5 (2024-2026)

	Year 4												Year 5											
Activity	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**	**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**	**J**	**F**
Planting																								
Monitoring																								
General Maintenance																								
Annual Report																								

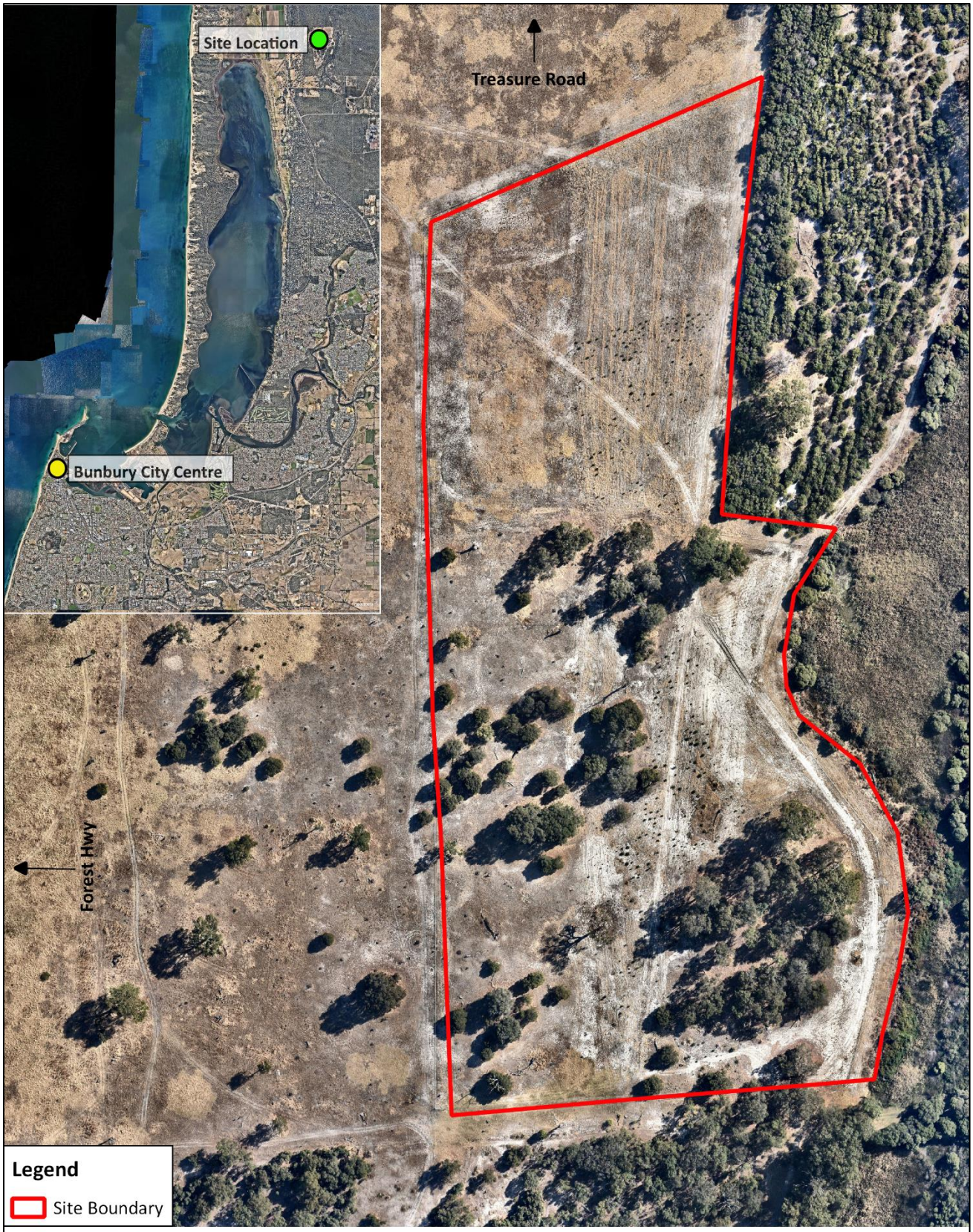

Figure 1:
Offset Site Location
Kemerton

2.0 Methods

Eight 5 m x 5 m quadrats (10 m^2) (Table 4) and six photo monitoring points (Table 5) were installed within the offset site on the 31st of March 2022 and evenly distributed across the site (Figure 2). Each quadrat was demarcated in the field with stakes and flagging tape, and the GPS Coordinates from the centre of the quadrat recorded (Table 1). Monitoring involved traversing the site on foot, to minimise damage to vegetation, and recording the following data in each quadrat:

- native species stem count
- native species density (measured as stems per m^2)
- need species cover as a whole and for individual species
- native and weed species health, measured on a scale of 1-5, with 1 being in poor health and 5 being in excellent health
- native and weed species diversity, measured as the number of different species in the quadrat.

The six photo monitoring points were marked with stakes and flagging tape. A photo will be taken at each of these points during each monitoring event, to allow for a visual comparison of the offset site over time. The GPS locations for quadrats and photo monitoring points are provided in Table 4 and 5. The initial monitoring will establish a baseline for future monitoring to assess revegetation progression over time.

Table 4: Quadrat central point GPS locations

ID	Longitude	Latitude
Q1	115.733534	-33.190590
Q2	115.733073	-33.190965
Q3	115.733340	-33.191859
Q4	115.733490	-33.192275
Q5	115.734330	-33.193146
Q6	115.733520	-33.193574
Q7	115.733101	-33.193090
Q8	115.733048	-33.192613

Table 5: Photo monitoring point GPS locations

ID	Longitude	Latitude	Direction
PP1	115.733704	-33.189779	South-west
PP2	115.732724	-33.190003	South-east
PP3	115.733353	-33.191440	South
PP4	115.734054	-33.192393	West
PP5	115.734367	-33.193247	West-southwest
PP6	115.732884	-33.193672	North

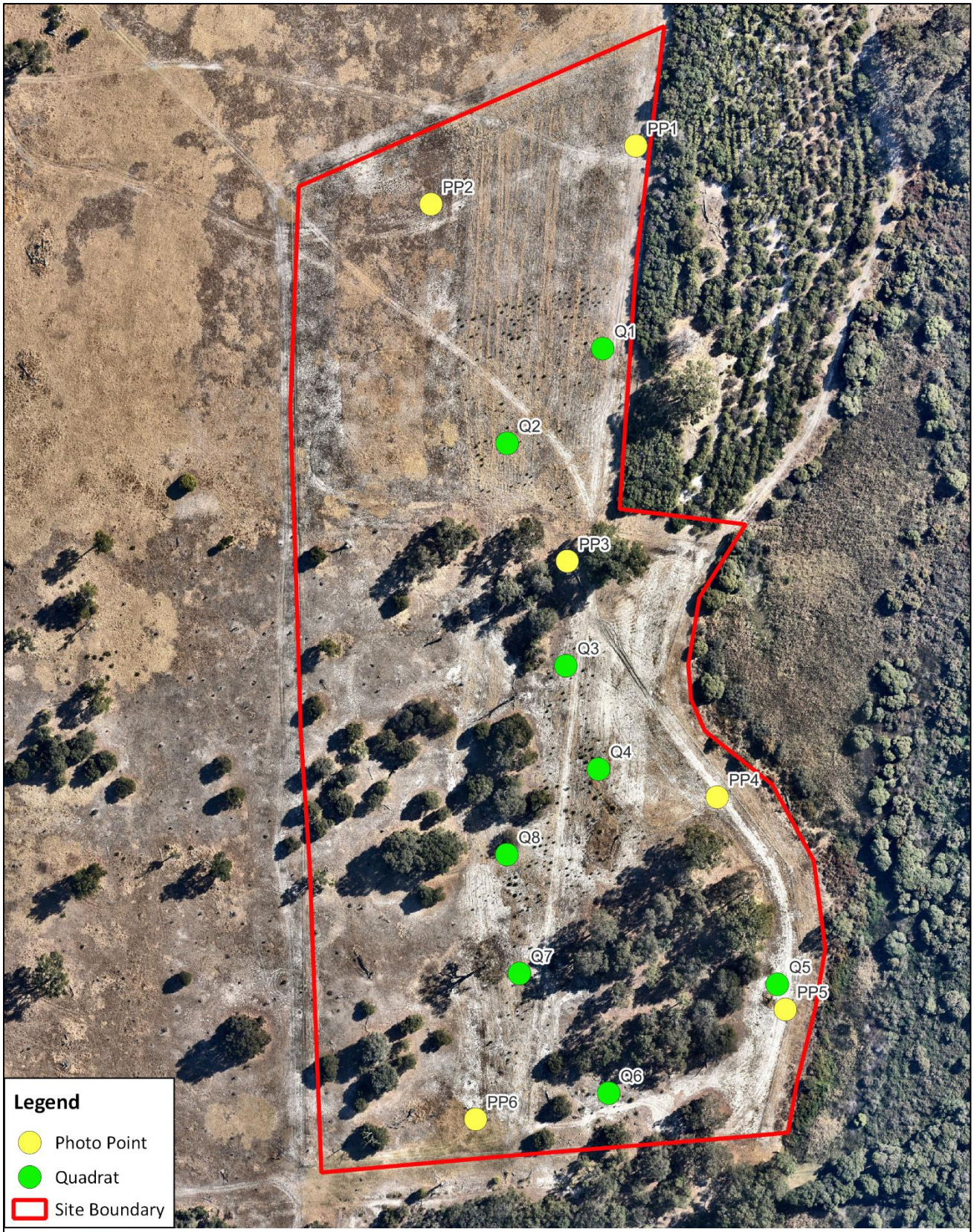

Figure 2:
Quadrat and Photo Monitoring Point Locations

3.0 Results

A total of eight native species and three weed species were identified within the eight quadrats in March 2022. All of the eight native flora species were present as a result of revegetation activities (Table 6), representing 89% species diversity of the species installed during revegetation in 2021. Complete monitoring data is provided in Appendix 1, a summary of the quadrat results is provided in Table 7.

Table 6: Planting mix and presence

Species used in revegetation	Present Autumn 2022
Acacia saligna	X
Agonis flexuosa	X
Banksia attenuata	X
Banksia grandis	X
Banksia littoralis	X
Corymbia calophylla	X
Eucalyptus gomphocephala	X
Eucalyptus marginata	
Eucalyptus rudis	X

Average native species density was recorded at 0.4 stems/m^2, with average native species cover of quadrats being low (8.3%). Evidence of tubestock death was observed in two quadrats (Q1 and Q8). Overall, survival of tubestock was observed to be high, with high health ratings across the site. The low density and species cover are likely due to the low initial revegetation density, with only overstorey species installed. Further planting of 31,370 tubestock scheduled for the 2022 winter period is anticipated to greatly increase native species diversity and cover. The most prevalent revegetation species were *Acacia saligna* and *Eucalyptus gomphocephala*, which represented 25.8% and 22.6% of plants surviving in Autumn 2022.

Table 7: Summary of quadrat monitoring data (Autumn 2022)

Parameter	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Ave
Native species cover (%)	10	7	10	5	12	12	5	5	**8.3**
Native species density (stems per m^2)	0.4	0.3	0.4	0.3	0.5	0.5	0.3	0.4	**0.4**
Native species diversity	4	3	3	3	3	3	2	3	**3**
Native species health (low: 1 – high: 5)	4	4	4	4	4	4	4	3	**3.9**
Dead stems (No.)	1	0	0	0	0	0	0	1	**0.3**
Weed species cover (%)	2	1	0	0	3	1	0	0	**0.9**
Weed species diversity	1	2	0	0	2	1	0	0	**0.8**
Weed species health (1-5)	2	2	N/A	N/A	2	2	N/A	N/A	**2**

Weed cover and species diversity were low throughout the revegetation site (0.9% and 0.8 respectively), and none of the weed species of importance to the Shire (listed in Table 8) were identified within the quadrats. Observed health of weed species present was also low. Works undertaken on site by Natural Area following revegetation in August 2021 have included manual and chemical weed control, via the application of a non-selective herbicide to all weeds. Weed control activities conducted have ensured that the percentage cover of weeds in the site remains low. Additionally, no Weeds of National Significance (WONS) or declared pests were recorded within the quadrats.

The high survival and health of tubestock observed during the Autumn 2022 monitoring can be partially attributed to the mitigation of potential success inhibiting factors. The summer of 2021/2022 was characterised by unseasonably and extended hot and dry weather conditions. However, watering was conducted over this period, which minimised the impact of these unfavourable conditions. The exclusion fence installed in August to September 2021 was observed to be in good condition, with no repairs required, therefore limiting the presence of herbivores within the site. Minimal signs of grazing were identified, likely a result of access gates being left open by third parties. No direct sightings of rabbits or kangaroos were recorded within the offset site. Additionally, no rubbish was observed within the site.

3.1 Completion Criteria Assessment

The assessment of current revegetation against the completion criteria is provided in Table 4 below.

Table 8: Completion criteria assessment as of Autumn 2022

Criteria	Is Criteria being met?	Comments
Tubestock survival rate of at least 70%	Yes	Current tubestock survival rate is estimated to be at 80%, with minimal mortality.
Area of bare ground no greater than 30 m^2	N/A	Not all tubestock have been installed to date. A further 31,370 are scheduled to be installed in winter 2022.
Decrease > 70% in cover and population density of Perennial Veldt Grass (*Ehrharta calycina*)	Yes	No Perennial Veldt Grass was identified on site.
Decrease of 90% in the cover of Red Ink Plant (*Phytolacca octandra*) and False Onion Weed (*Trachyandra divaricata*)	Yes	No Red Ink Plant was identified on site. False Onion Weed was only identified in two quadrats, with an average cover of 1.5%.
Eradication of Blackberry (*Rubus laudatus*) and Arum Lily (*Zantedeschia aethiopica*)	Yes	No Blackberry or Arum Lily were identified on site.
No obvious presence of rabbits or kangaroos	No	Evidence of grazing was observed.
Maximum of 5% of plants affected by rabbit and/or kangaroo herbivory	Yes	Grazing observed on site was minimal, affecting approximately 2% of tubestock, and no rabbits or kangaroos were observed.
Gates and boundary fence in good condition	Yes	No damage was identified.

4.0 Recommendations

Based on the Autumn 2022 monitoring, Natural Area provides the following recommendations to the Shire:

1. Installation of a further 31,370 tubestock in Winter 2022.
2. Herbicide application (glyphosate) in July and September 2022.
3. Monitoring event in Spring 2022.
4. Watering of tubestock over 2022/2023 Summer.
5. Pest animal control not recommended.

More information on each recommendation is detailed below.

Due to supply and timing constraints, not all revegetation species were able to be installed in August 2021. As a result, a total of 3,630 tubestock from nine overstorey species were installed, with the remaining 31,370 tubestock from 53 species to be installed over the winter of 2022. Following this, a second monitoring event will occur in Spring 2022.

Between this April 2022 monitoring event, and the upcoming Spring 2022 monitoring event, it is likely that weed species richness and density will increase due to the seasonal cycle of weed species growth and senescence. Two rounds of weed control (glyphosate application) are scheduled for July and September of 2022 to target weeds within optimal treatment timings and maintain low weed densities. It is recommended that these weed control events and the next monitoring event focus on the presence of weed species of importance to the Shire, being:

- Perennial Veldt Grass (*Ehrharta calycina*)
- Red Ink Plant (*Phytolacca octandra*)
- False Onion Weed (*Trachyandra divaricata*)
- Blackberry (*Rubus laudatus*)
- Arum Lily (*Zantedeschia aethiopica*)

This will ensure that any weeds of importance are identified and treated promptly within the next round of herbicide application, to prevent spread.

The second monitoring event will be able to assess the survival of all revegetation species, however the 2022 tubestock will not yet have experienced summer conditions. Watering is recommended to recommence over the 2022/2023 summer, to promote tubestock growth and maximise survival, as this was a significant facilitating factor for the 2021 tubestock. The second annual monitoring report will assess the survival of revegetation species utilised by black cockatoos to inform infill planting requirements the following winter, as the site is intended to offset the clearing of black cockatoo habitat in road reserves.

Pest animal control is not recommended, as very minimal grazing, and no other disturbance by herbivores were observed on site. The next scheduled rabbit control event is for January 2023, and the need for this will be assessed during the Spring 2022 monitoring. It was observed that the entry gate to the site has been accessed by third parties and potentially left open, enabling the movement of kangaroos within the site. This entry gate has since been fitted with a padlock to prevent unauthorised access.

Appendix 1 – Quadrat Monitoring Data

Site: Kemerton Offset	**Quadrat No:** 1
Date: 31/03/2022	**Photo ID:** Quadrat 1
Location Description: NE corner	**GPS:** -33.190590, 115.733534
Native Vegetation	**Weeds**
Health (Rate 1-5; 1=Poor): 4	**Health (Rate 1-5; 1=Poor):** 2
Native Abundance (% Cover): 10%	**Weed Abundance (% Cover):** 2%
Survival (dead stems): 1	
Comments/Recommendations:	

Native Species Present		**Weed Species Present**	
Species	**No:**	**Species**	**No:**
Corymbia calophylla	1	*Trachyandra divaricata*	4
Acacia saligna	1		
Agonis flexuosa	1		
Eucalyptus rudis	1		
Acacia saligna (dead)	1		
Total:	4	**Total:**	4
Species Diversity:	**4**	**Species Diversity:**	**1**

Site: Kemerton Offset	**Quadrat No:** 2
Date: 31/03/2022	**Photo ID:** Quadrat 2
Location Description: Middle of site west side of track a third of the way down.	**GPS:** 33.190965, 115.733073
Native Vegetation	**Weeds**
Health (Rate 1-5; 1=Poor): 4	**Health (Rate 1-5; 1=Poor):** 2
Native Abundance (% Cover): 7%	**Weed Abundance (% Cover):** 1%
Survival (dead stems): 0	
Comments/Recommendations:	

Native Species Present		**Weed Species Present**	
Species	**No:**	**Species**	**No:**
Corymbia calophylla	1	*Trachyandra divaricata*	1
Banksia attenuata	1	*Cynodon dactylon*	1
Banksia littoralis	1		
Total:	3	**Total:**	2
Species Diversity:	**3**	**Species Diversity:**	**2**

Site: Kemerton Offset	**Quadrat No:** 3
Date: 31/03/2022	**Photo ID:** Quadrat 3
Location Description: Middle of site. West side of track.	**GPS:** -33.191859, 115.733340
Native Vegetation	**Weeds**
Health (Rate 1-5; 1=Poor): 4	**Health (Rate 1-5; 1=Poor):** N/A
Native Abundance (% Cover): 10%	**Weed Abundance (% Cover):** N/A
Survival (dead stems): 0	
Comments/Recommendations:	

Native Species Present		**Weed Species Present**	
Species	**No:**	**Species**	**No:**
Acacia saligna	2		
Banksia attenuata	1		
Eucalyptus gomphocephala	1		
Total:	4	**Total:**	0
Species Diversity:	**3**	**Species Diversity:**	**0**

Site: Kemerton Offset	**Quadrat No:** 4
Date: 31/03/2022	**Photo ID:** Quadrat 4
Location Description: Slightly south of middle of site. East of track.	**GPS:** -33.192275, 115.733490
Native Vegetation	**Weeds**
Health (Rate 1-5; 1=Poor): 4	**Health (Rate 1-5; 1=Poor):** N/A
Native Abundance (% Cover): 5%	**Weed Abundance (% Cover):** N/A
Survival (dead stems):	0
Comments/Recommendations:	

Native Species Present		**Weed Species Present**	
Species	**No:**	**Species**	**No:**
Corymbia calophylla	1		
Acacia saligna	1		
Banksia attenuata	1		
Total:	3	**Total:**	0
Species Diversity:	**3**	**Species Diversity:**	**0**

Site: Kemerton Offset	**Quadrat No:** 5
Date: 31/03/2022	**Photo ID:** Quadrat 5
Location Description: South-east corner of site	**GPS:** -33.193146, 115.734330
Native Vegetation	**Weeds**
Health (Rate 1-5; 1=Poor): 4	**Health (Rate 1-5; 1=Poor):** 2
Native Abundance (% Cover): 12%	**Weed Abundance (% Cover):** 3%
Survival (dead stems): 0	
Comments/Recommendations:	

Native Species Present		**Weed Species Present**	
Species	**No:**	**Species**	**No:**
Acacia saligna	2	*Cynodon dactylon*	3
Eucalyptus gomphocephala	2	*Conyza sp.*	1
Banksia grandis	1		
Total:	5	**Total:**	4
Species Diversity:	**3**	**Species Diversity:**	**2**

Site: Kemerton Offset	**Quadrat No:** 6
Date: 31/03/2022	**Photo ID:** Quadrat 6
Location Description: Southern boundary	**GPS:** -33.193574, 115.733520
Native Vegetation	**Weeds**
Health (Rate 1-5; 1=Poor): 4	**Health (Rate 1-5; 1=Poor):** 2
Native Abundance (% Cover): 12%	**Weed Abundance (% Cover):** 1%
Survival (dead stems): 0	
Comments/Recommendations:	

Native Species Present		**Weed Species Present**	
Species	**No:**	**Species**	**No:**
Acacia saligna	2	*Cynodon dactylon*	1
Banksia attenuata	1		
Eucalyptus gomphocephala	2		
Total:	5	**Total:**	1
Species Diversity:	**3**	**Species Diversity:**	**1**

Site: Kemerton Offset	**Quadrat No:** 7
Date: 31/03/2022	**Photo ID:** Quadrat 7
Location Description: South-west section of site two thirds of the way down	**GPS:** -33.193090, 115.733101
Native Vegetation	**Weeds**
Health (Rate 1-5; 1=Poor): 4	**Health (Rate 1-5; 1=Poor):** N/A
Native Abundance (% Cover): 5%	**Weed Abundance (% Cover):** N/A
Survival (dead stems): 0	
Comments/Recommendations:	

Native Species Present		**Weed Species Present**	
Species	**No:**	**Species**	**No:**
Banksia attenuata	1		
Eucalyptus gomphocephala	2		
Total:	3	**Total:**	0
Species Diversity:	**2**	**Species Diversity:**	**0**

Site: Kemerton Offset	**Quadrat No:** 8
Date: 31/03/2022	**Photo ID:** Quadrat 8
Location Description: Just south of the middle of site, western side of track	**GPS:** -33.192613, 115.733048
Native Vegetation	**Weeds**
Health (Rate 1-5; 1=Poor): 3	**Health (Rate 1-5; 1=Poor):** N/A
Native Abundance (% Cover): 5%	**Weed Abundance (% Cover):** N/A
Survival (dead stems): 1	
Comments/Recommendations:	

Native Species Present		**Weed Species Present**	
Species	**No:**	**Species**	**No:**
Agonis flexuosa	1		
Banksia littoralis	1		
Corymbia calophylla	2		
Banksia littoralis (dead)	1		
Total:	4	**Total:**	0
Species Diversity:	**3**	**Species Diversity:**	**0**

Appendix 2 – Quadrat Photos

Quadrat Number	April 2022
1	
2	

Quadrat Number	April 2022
3	
4	

Quadrat Number	April 2022
5	
6	

Quadrat Number	April 2022
7	
8	

Appendix 3 – Photo Monitoring

Photo Point Number	April 2022
1	
2	

Photo Point Number	April 2022
3	
4	

Photo Point Number	April 2022
5	
6